"Miniwatt"

UCH 21

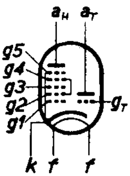
TRIODE-HEPTODE for use as frequency converter, H.F., I.F. and L.F. amplifier and phase inverter

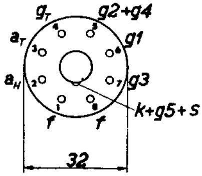
TRIODE-HEPTODE pour utilisation comme changeuse de fréquence, amplificatrice H.F., M.F. et B.F. et comme tube inverseur de phase

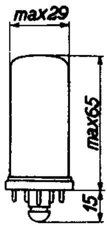
TRIODE-HEPTODE zur Verwendung als Mischröhre, H.F.-, Z.F.- und N.F. Verstärker und als Phasenumkehrröhre

Heating:	indirect by A.C. or D.C.; series supply	
Chauffage:	indirect par C.A. ou C.C.; alimentation en série	Vf= 20 V If=0,100 A
Heizung:	indirekt durch Wechsel- oder Gleichstrom; Serienspeisung	

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Capacities Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil	Triode section Partie triode Triodenteil
	Cg1 = 6,5 pF	Cg = 3,8 pF
	Ca = 8 pF	Ca = 3,1 pF
	Cag1 <0,002 pF	Cag = 1,1 pF
	Cg3 = 8 pF	Cgk = 2,7 pF
	Cg1g3 < 0,3 pF	Cak = 1,6 pF
	Cg1f <0,007 pF	Cgf < 0,1 pF

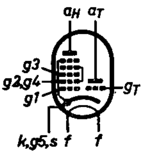
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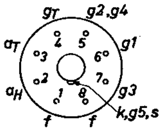
TRIODE-HEPTODE for use as frequency changer, R.F., I.F. or A.F. amplifier and phase inverter
TRIODE-HEPTODE pour utilisation en changeuse de fréquence, amplificatrice H.F., M.F. ou B.F. et comme tube inverseur de phase
TRIODE-HEPTODE zur Verwendung als Mischröhre, HF-, ZF- oder NF-Verstärker und als Phasenumkehrröhre

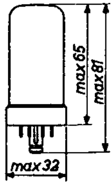
Heating : indirect; series supply
Chauffage: indirect; alimentation- série
Heizung : indirekt; Serienspeisung

V_f = 20 V
I_f =100 mA

Dimensions in mm
Dimensions en mm
Abmessungen in mm







Base, culot, Sockel: Loctal 8p.

Capacitances Capacités Kapazitäten	Heptode section Partie heptode Heptodenteil	Triode section Partie triode Triodenteil
	C_{g1} = 6,5 pF	C_g = 3,8 pF
	C_a = 8 pF	C_a = 3,1 pF
	C_{ag1} <0,002 pF	C_{ag} = 1,1 pF
	C_{g3} = 8 pF	C_{gk} = 2,7 pF
	C_{g1g3} < 0,3 pF	C_{ak} = 1,6 pF
	C_{g1f} <0,007 pF	C_{gf} < 0,1 pF

Between heptode and triode sections
Entre les parties heptode et triode
Zwischen Heptoden- und Triodenteil

C_{gTg1H} < 0,1 pF
C_{gT+g3} = 12,3 pF
$C_{(gT+g3)g1H}$ < 0,35 pF
$C_{(gT+g3)aH}$ < 0,1 pF

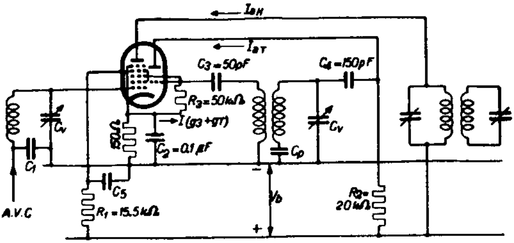
UCH 21 "Miniwatt"

Capacities Capacités Kapazitäten	Between heptode and triode sections Entre les parties heptode et triode Zwischen Heptoden- und Triodenteil

CgTg1H	<	0,1 pF
CgT+g3	=	12,3 pF
C(gT+g3)g1H	<	0,35 pF
C(gT+g3)aH	<	0,1 pF

Operating characteristics of the heptode section as frequency converter (g3 connected to gT)
Caractéristiques d'utilisation de la partie heptode comme changeuse de fréquence (g3 reliée à gT)
Betriebsdaten des Heptodenteiles als Mischröhre (g3 verbunden mit gT)

Va=Vb	=	100		200		V
Rg2+g4	=	15,5		15,5		kΩ
Rk	=	150		150		Ω
Rg3+gT	=	50		50		kΩ
Ig3+gT	=	95		190		µA
Vg1	=	-1	-14	-2	-28	V
Vg2+g4	=	53	100	100	200	V
Ia	=	1,5	-	3,5	-	mA
Ig2+g4	=	3	-	6,5	-	mA
Sc	=	580	5,8	750	7,5	µA/V
Ri	=	1,0	> 10	1,0	> 10	MΩ
Req	=	40	-	55	-	kΩ



Operating characteristics of the heptode section as frequency changer (g3 connected to gT)
Caractéristiques d'utilisation de la partie heptode en changeuse de fréquence (g3 reliée à gT)
Betriebsdaten des Heptodenteiles als Mischröhre (g3 verbunden mit gT)

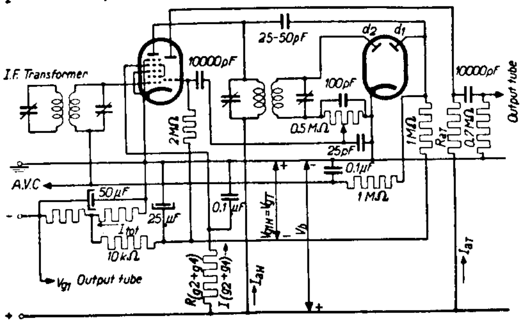
$V_a = V_b$	=	100		200		V
$R_{g2,g4}$	=	15,5		15,5		kΩ
R_k	=	150		150		Ω
R_{g3+gT}	=	50		50		kΩ
I_{g3+gT}	=	95		190		μA
V_{g1}	=	-1	-14	-2	-28	V
$V_{g2,g4}$	=	53	100	100	200	V
I_a	=	1,5	-	3,5	-	mA
$I_{g2,g4}$	=	3	-	6,5	-	mA
S_c	=	580	5,8	750	7,5	μA/V
R_i	=	1,0	>10	1,0	>10	MΩ
R_{eq}	=	40	-	55	-	kΩ

Operating characteristics of the heptode section as I.F. amplifier (g3 disconnected from gT)
Caractéristiques d'utilisation de la partie heptode en amplificatrice M.F. (g3 non reliée à gT)
Betriebsdaten des Heptodenteiles als ZF-Verstärker (g3 frei von gT)

$V_a = V_b$	=	100			200			V
V_{g3}	=	0			0			V
$R_{g2,g4}$	=	30			30			kΩ
V_{g1}	=	-1,0	-15	-20	-2,0	-28	-36	V
$V_{g2,g4}$	=	50	-	98	94	-	200	V
I_a	=	2,6	-	-	5,2	-	-	mA
$I_{g2,g4}$	=	1,9	-	-	3,5	-	-	mA
S	=	2000	20	2,0	2200	22	2,2	μA/V
R_i	=	0,7	>10	>10	0,7	>10	>10	MΩ
μ_{g2g1}	=	19	-	-	19	-	-	
R_{eq}	=	4,9	-	-	9	-	-	kΩ

Operating characteristics of the heptode section as I.F. amplifier (g3 disconnected from gT)
Caractéristiques d'utilisation de la partie heptode comme amplificatrice M.F. (g3 non reliée à gT)
Betriebsdaten des Heptodenteiles als Z.F.Verstärker (g3 frei von gT)

Va=Vb =		100			200		V
Vg3 =		0			0		V
Rg2+g4 =		30			30		kΩ
Vg1 =	-1,0	-15	-20	-2,0	-28	-36	V
Vg2+g4 =	50	-	98	94	-	200	V
Ia =	2,6	-	-	5,2	-	-	mA
Ig2+g4 =	1,9	-	-	3,5	-	-	mA
S =	2000	20	2,0	2200	22	2,2	μA/V
Ri =	0,7	>10	>10	0,7	>10	>10	MΩ
μg2g1 =	19	-	-	19	-	-	
Req =	4,9	-	-	9	-	-	kΩ



Typical characteristics of the triode section
Caractéristiques typiques de la partie triode
Kenndaten des Triodenteiles

Va =	100	V
Vg =	0	V
Ia =	12	mA
S =	3,2	mA/V
μ =	19	

Typical characteristics of the triode section
Caractéristiques types de la partie triode
Kenndaten des Triodenteiles

V_a	=	100 V
V_g	=	0 V
I_a	=	12 mA
S	=	3,2 mA/V
μ	=	19

Operating characteristics of the triode section as oscillator (g3 connected to gT)
Caractéristiques d'utilisation de la partie triode en oscillatrice (g3 reliée à gT)
Betriebsdaten des Triodenteiles als Oszillator (g3 verbunden mit gT)

V_b	=	100	200	V
R_a	=	20	20	kΩ
R_{gT+g3}	=	50	50	kΩ
I_{gT+g3}	=	95	190	μA
I_a	=	1,9	4,1	mA
S_{eff}	=	0,44	0,45	mA/V

Operating characteristics of the triode section as A.F. amplifier with resistance coupling (gT disconnected from g3)
Caractéristiques d'utilisation de la partie triode en amplificatrice B.F. avec couplage à résistances (gT non reliée à g3)
Betriebsdaten des Triodenteiles als NF-Verstärker mit Widerstandskopplung (gT frei von g3)

V_b (V)	R_a (MΩ)	V_g (V)	I_a (mA)	V_o (V_{eff})	$\frac{V_o}{V_i}$	d_{tot} (%)
200	0,2	-2	0,8	7,5	10	2,8
100	0,2	-1	0,37	7,5	10	6,0
200	0,1	-2	1,5	7,5	10,5	2,8
100	0,1	-1	0,68	7,5	10,5	5,8
200	0,05	-2	2,8	7,5	11	2,2
100	0,05	-1	1,3	7,5	11	5,4

Operating characteristics of the triode section as oscillator (g3 connected to gT)
Caractéristiques d'utilisation de la partie triode comme oscillatrice (g3 reliée à gT)
Betriebsdaten des Triodenteiles als Oszillator (g3 verbunden mit gT)

Vb	=	100	200	V
Ra	=	20	20	kΩ
RgT+g3	=	50	50	kΩ
IgT+g3	=	95	190	μA
Ia	=	1,9	4,1	mA
S_{eff}	=	0,44	0,45	mA/V

Operating characteristics of the triode section as L.F. amplifier with resistance coupling (gT disconnected from g3)
Caractéristiques d'utilisation de la partie triode comme amplificatrice B.F. avec couplage à résistances (gT non reliée à g3)
Betriebsdaten des Triodenteiles als N.F. Verstärker mit Widerstandskopplung (gT frei von g3)

Vb (V)	Ra (MΩ)	Vg (V)	Ia (mA)	Vo (V_{eff})	$\frac{Vo}{Vi}$	d_{tot} (%)
200	0,2	-2	0,8	7,5	10	2,8
100	0,2	-1	0,37	7,5	10	6,0
200	0,1	-2	1,5	7,5	10,5	2,8
100	0,1	-1	0,68	7,5	10,5	5,8
200	0,05	-2	2,8	7,5	11	2,2
100	0,05	-1	1,3	7,5	11	5,4

Characteristics for operation as phase inverter for modulating a push-pull amplifier
Caractéristiques d'utilisation comme tube inverseur de phase pour la modulation d'un amplificateur push-pull
Daten zur Verwendung als Phasenumkehrröhre zur Aussteuerung eines Gegentaktverstärkers

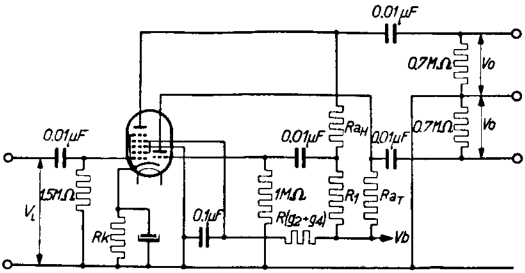
A. Without negative feedback
Sans couplage inverse
Ohne Gegenkopplung

Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

V_{a_o}	= max.	550 V
V_a	= max.	250 V
W_a	= max.	1,5 W
$V_{g2,g4_o}$	= max.	550 V
$V_{g2,g4}$ (I_a=3mA)	= max.	100 V
$V_{g2,g4}$ (I_a<1mA)	= max.	250 V
$W_{g2,g4}$	= max.	1 W
I_k	= max.	15 mA
V_{g1} (I_{g1}=+0,3µA)	= max.	-1,3 V
V_{g3} (I_{g3}=+0,3µA)	= max.	-1,3 V
R_{g1}	= max.	3 MΩ
R_{g3}	= max.	3 MΩ
R_{kf}	= max.	20 kΩ
V_{kf}	= max.	150 V

Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

V_{a_o}	= max.	550 V
V_a	= max.	175 V
W_a	= max.	0,5 W
V_g (I_g = +0,3µA)	= max.	-1,3 V
R_g	= max.	3 MΩ



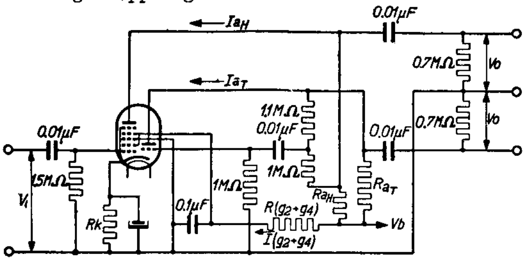
1) Rk = 750Ω; RaH = 0,2MΩ; R1 = 16kΩ; RaT = 0,1MΩ; Rg2+g4 = 0,2MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	Vo/Vi	d_{tot} (%)
200	2,0	0,75	10	90	1,4
100	1,0	0,38	10	70	6,0

2) Rk = 500Ω; RaH = 0,1MΩ; R1 = 8kΩ; RaT = 0,1 MΩ; Rg2+g4 = 0,1MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	Vo/Vi	d_{tot} (%)
200	2,7	1,36	10	80	1,4
100	1,2	0,66	10	60	4,5

B. With negative feedback
Avec couplage inverse
Mit Gegenkopplung



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12.10.1943

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1) Rk = 700 Ω; RaH = 0,2 MΩ; Rg2+g4 = 0,18 MΩ; RaT = 0,1 MΩ

Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	$\frac{Vo}{Vi}$	d_{tot} (%)
200	2,1	0,8	10	75	2,5
100	1,1	0,4	10	65	3,1

2) Rk = 500 Ω; RaH = 0,1 MΩ; Rg2 + g4 = 0,1 MΩ; RaT = 0,1 MΩ

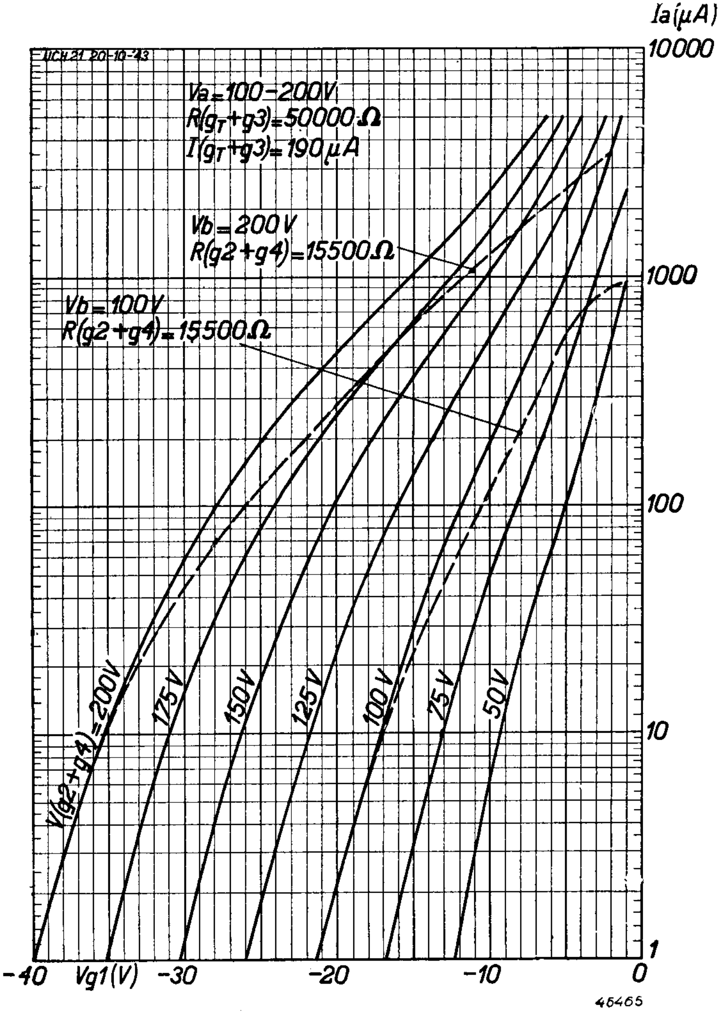
Vb (V)	IaH+IaT (mA)	Ig2+g4 (mA)	Vo (V_{eff})	$\frac{Vo}{Vi}$	d_{tot} (%)
200	2,7	1,3	10	70	2,3
100	1,3	0,65	10	55	2,4

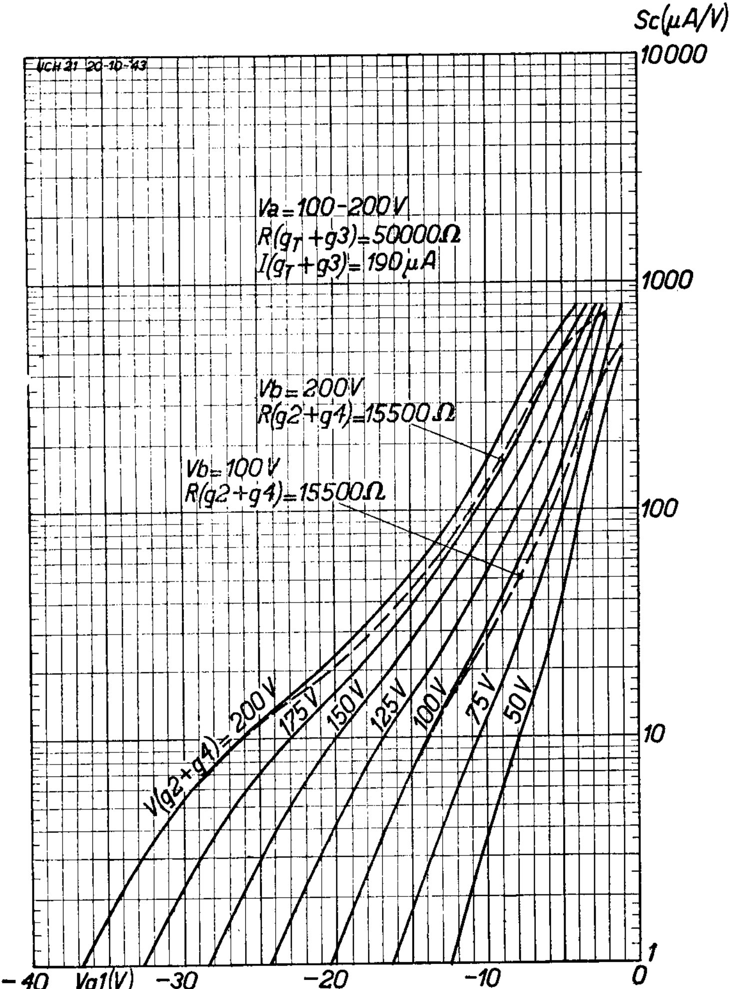
Limiting values of the heptode section
Caractéristiques limites de la partie heptode
Grenzdaten des Heptodenteiles

Va_o	= max. 550 V	$V(g2+g4)_o$	= max. 550 V
Va	= max. 250 V	Vg2+g4 (Ia=3mA)	= max. 100 V
Wa	= max. 1,5 W	Vg2+g4 (Ia<1mA)	= max. 250 V
Rg1	= max. 3 MΩ	Wg2+g4	= max. 1 W
Rg3	= max. 3 MΩ	Vg1 (Ig1=+0,3μA)	= max. -1,3 V
Rfk	= max. 20 kΩ	Vg3 (Ig3=+0,3μA)	= max. -1,3 V
Vfk	= max. 150 V	Ik	= max. 15 mA

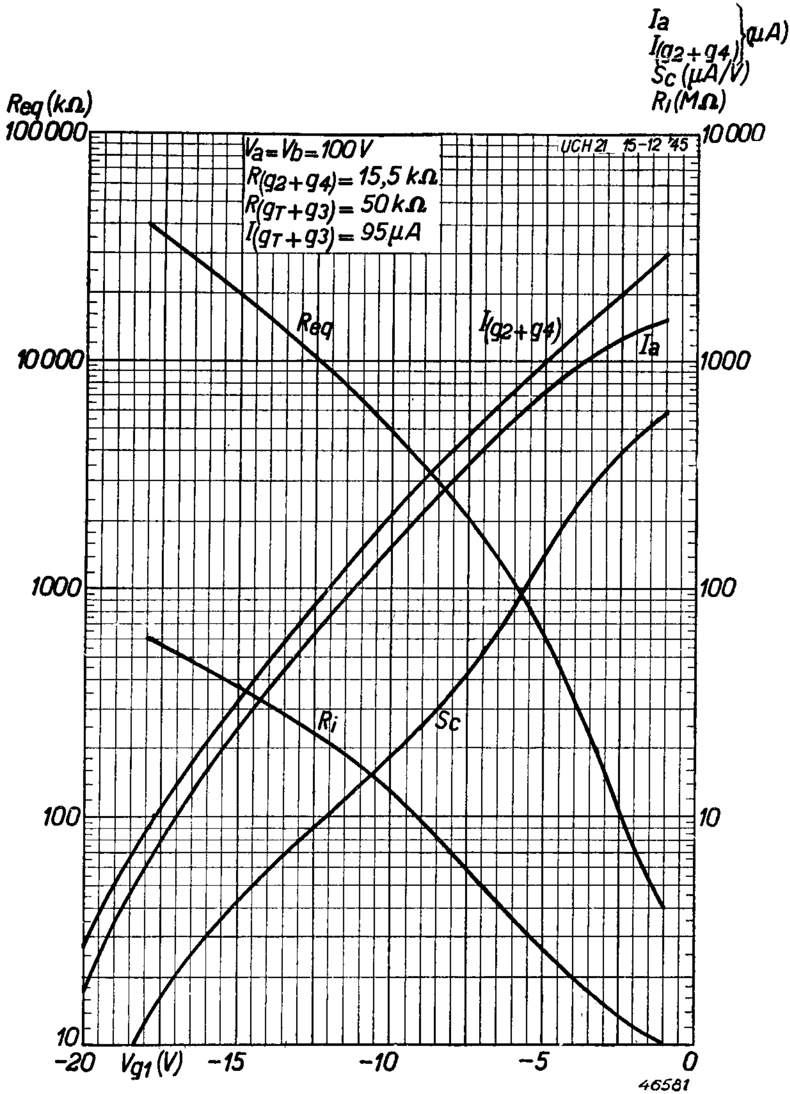
Limiting values of the triode section
Caractéristiques limites de la partie triode
Grenzdaten des Triodenteiles

Va_o	= max. 550 V
Va	= max. 175 V
Wa	= max. 0,5 W
Vg (Ig = +0,3μA)	= max. -1,3 V
Rg	= max. 3 MΩ

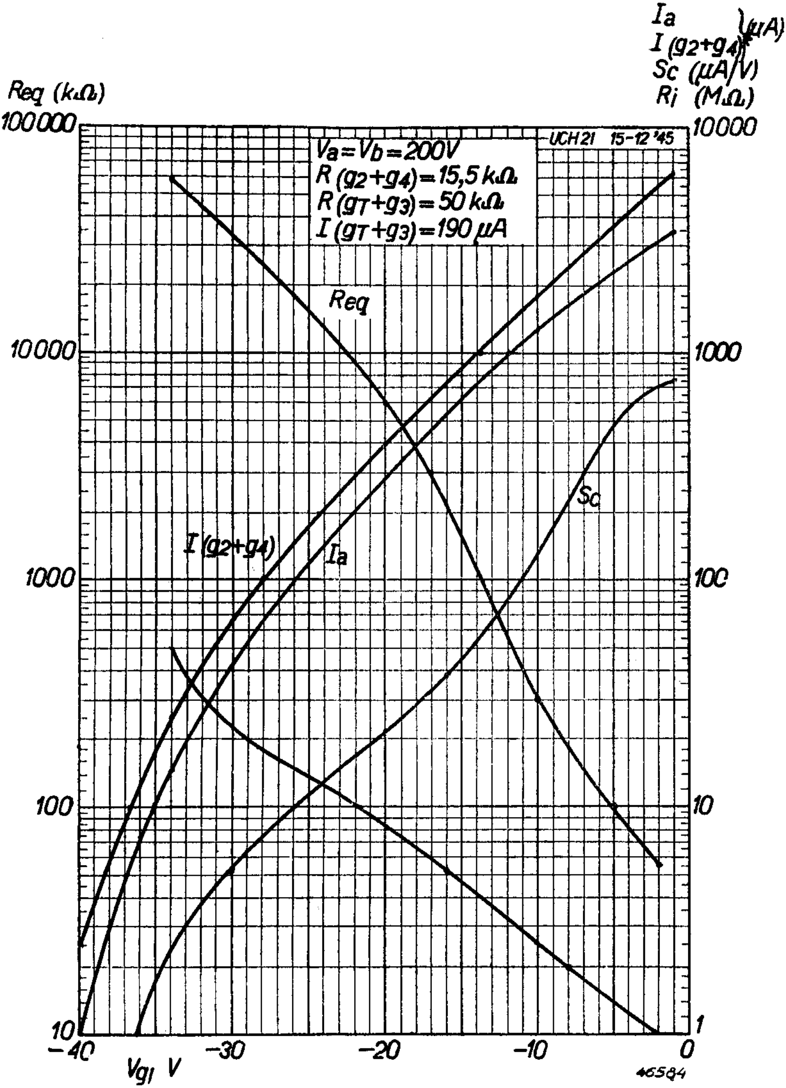

UCH 21 20-10-'43
Ia(μA)
10000
1000
100
10
1
Va=100-200V
R(gT+g3)=50000Ω
I(gT+g3)=190μA
Vb=200V
R(g2+g4)=15500Ω
Vb=100V
R(g2+g4)=15500Ω
V(g2+g4)=200V
175V
150V
125V
100V
75V
50V
-40
Vg1(V)
-30
-20
-10
0
46465


Sc(μA/V)
10000
1000
100
10
1
UCH 21 20-10-43
Va=100-200V
R(gT+g3)=50000Ω
I(gT+g3)=190μA
Vb=200V
R(g2+g4)=15500Ω
Vb=100V
R(g2+g4)=15500Ω
V(g2+g4)=200V
175V
150V
125V
100V
75V
50V
-40
Vg1(V)
-30
-20
-10
0
46464

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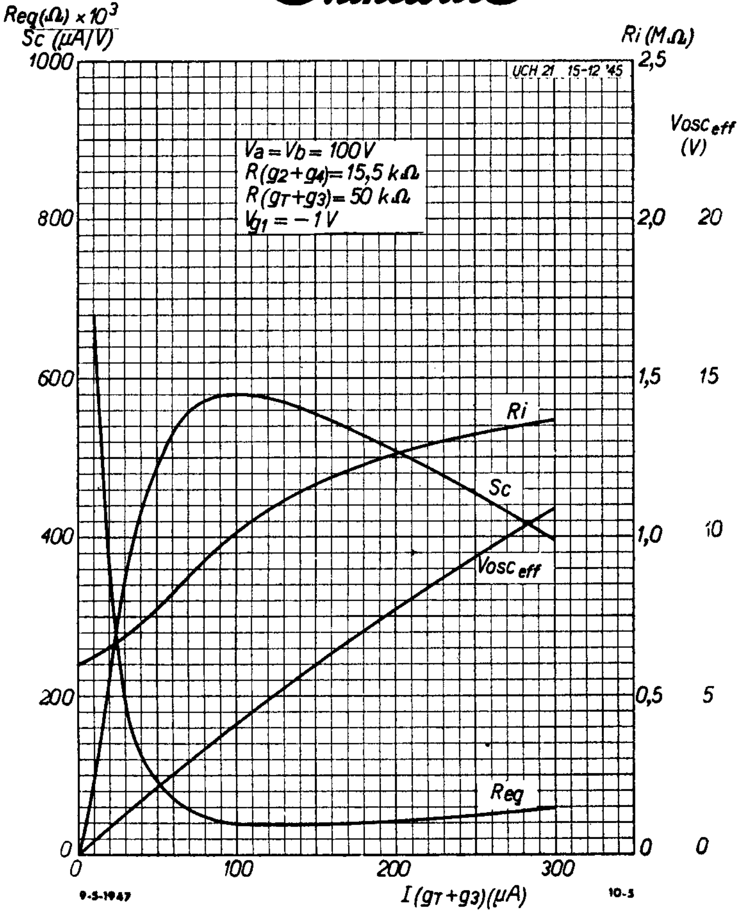


"Miniwatt" **UCH 21**

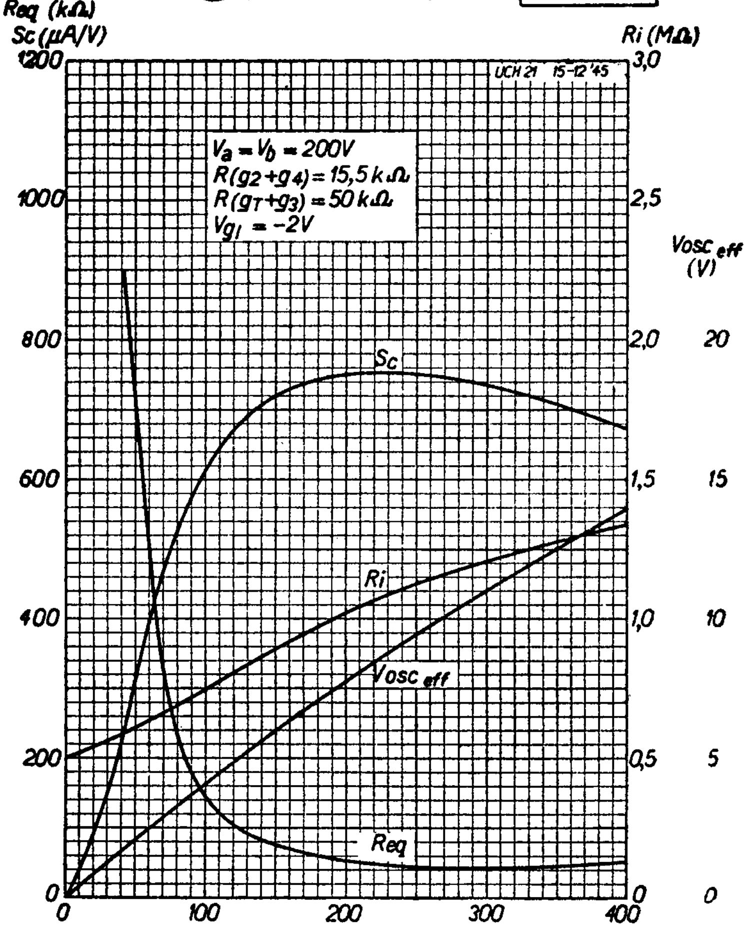


UCH 21

"Miniwatt"



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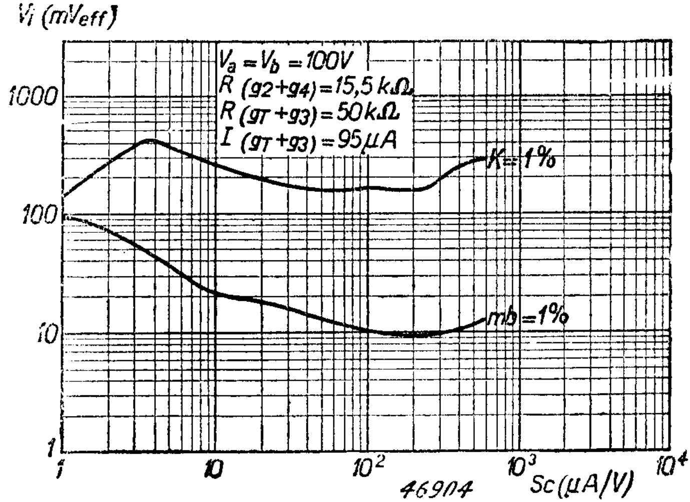


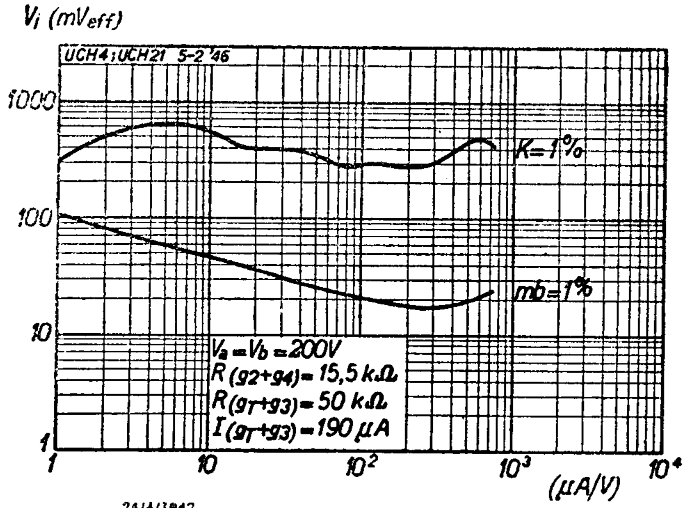
9-8-1947

11-5

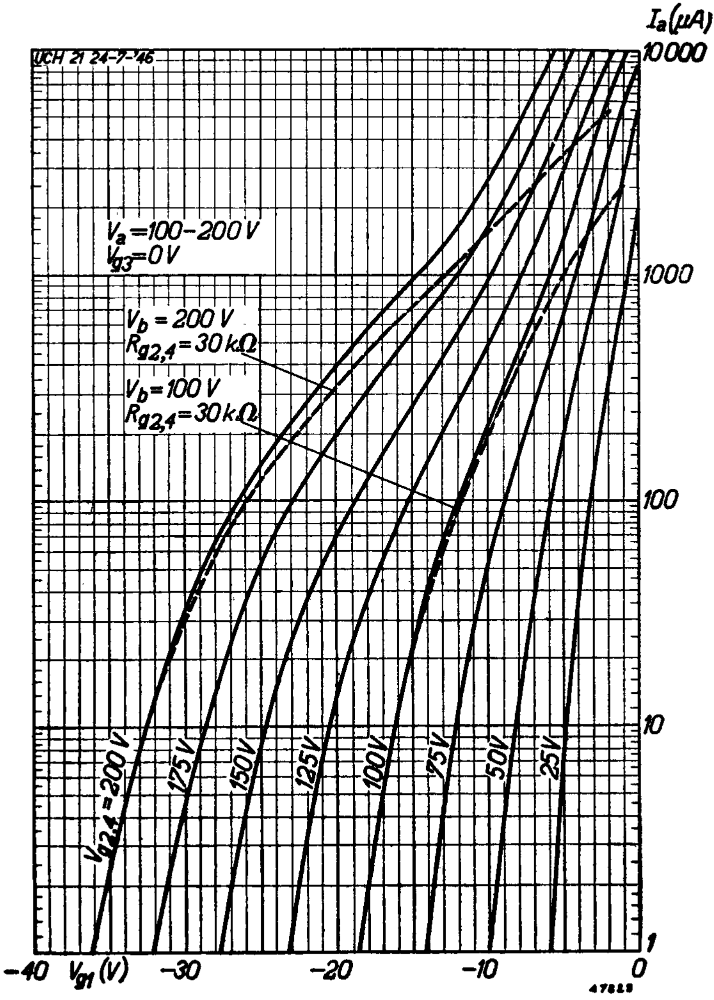
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UCH21 "Miniwatt"





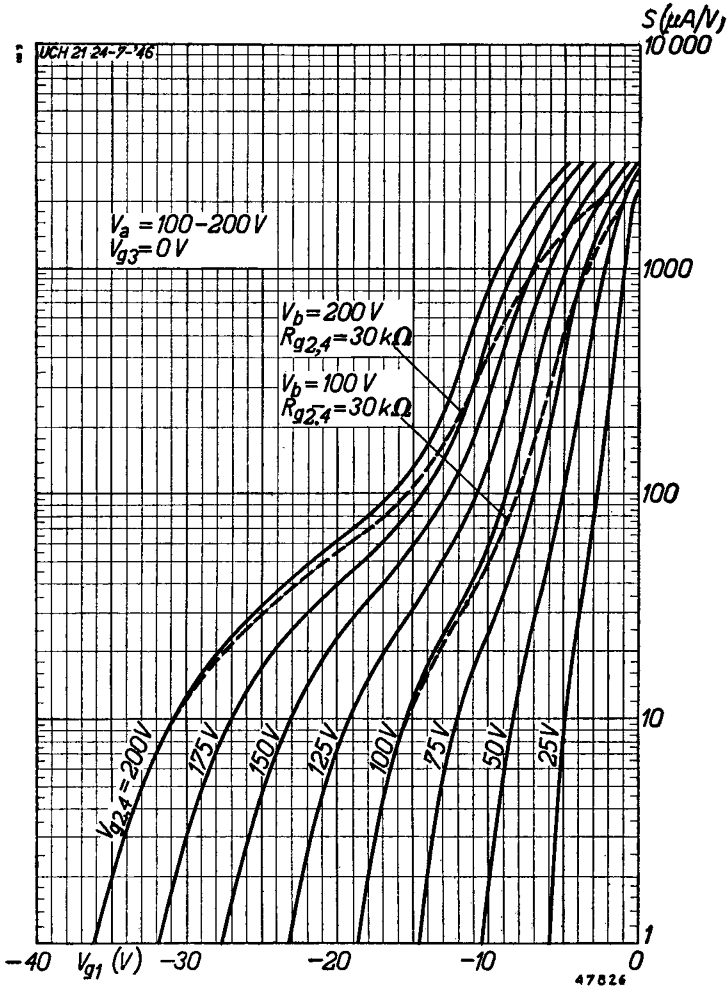
24/4/1947

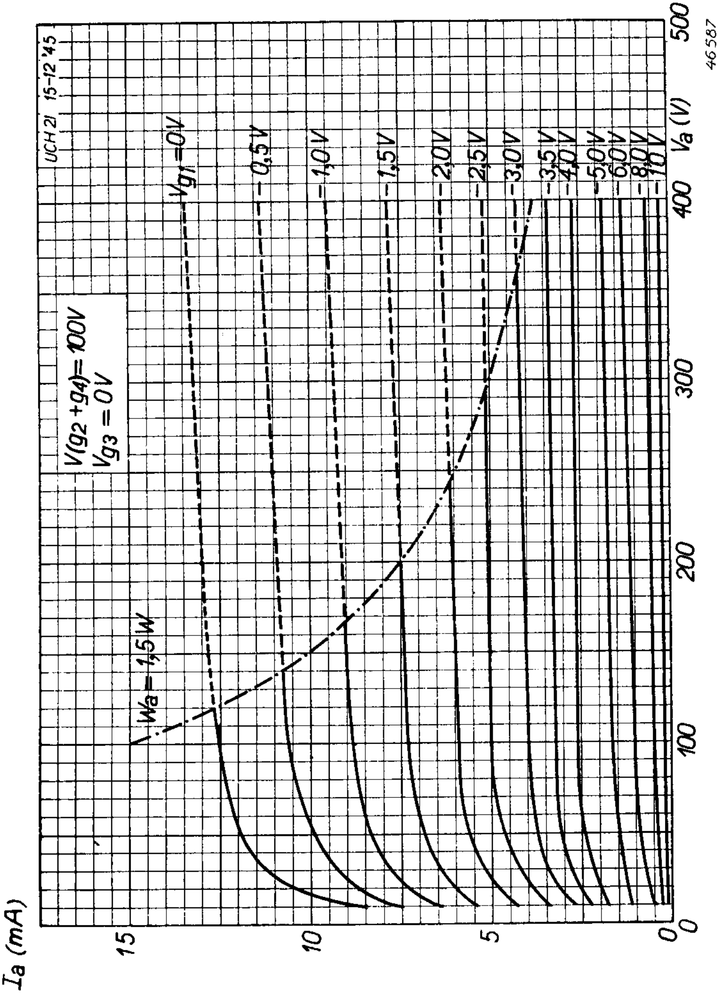


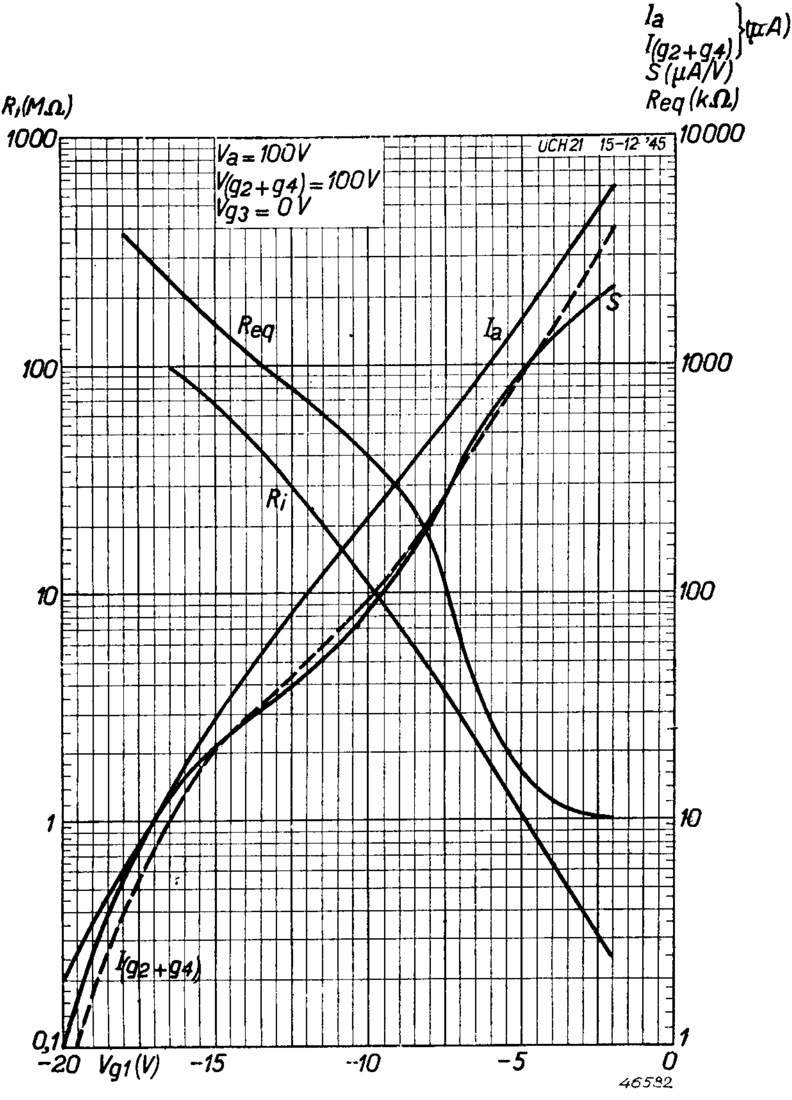
UCH 21 24-7-'46
I_a (µA)
10000
1000
100
10
1
V_a = 100-200 V
V_{g3} = 0 V
V_b = 200 V
$R_{g2,4}$ = 30 kΩ
V_b = 100 V
$R_{g2,4}$ = 30 kΩ
$V_{g2,4}$ = 200 V
175 V
150 V
125 V
100 V
75 V
50 V
25 V
-40
V_{g1} (V)
-30
-20
-10
0
47829

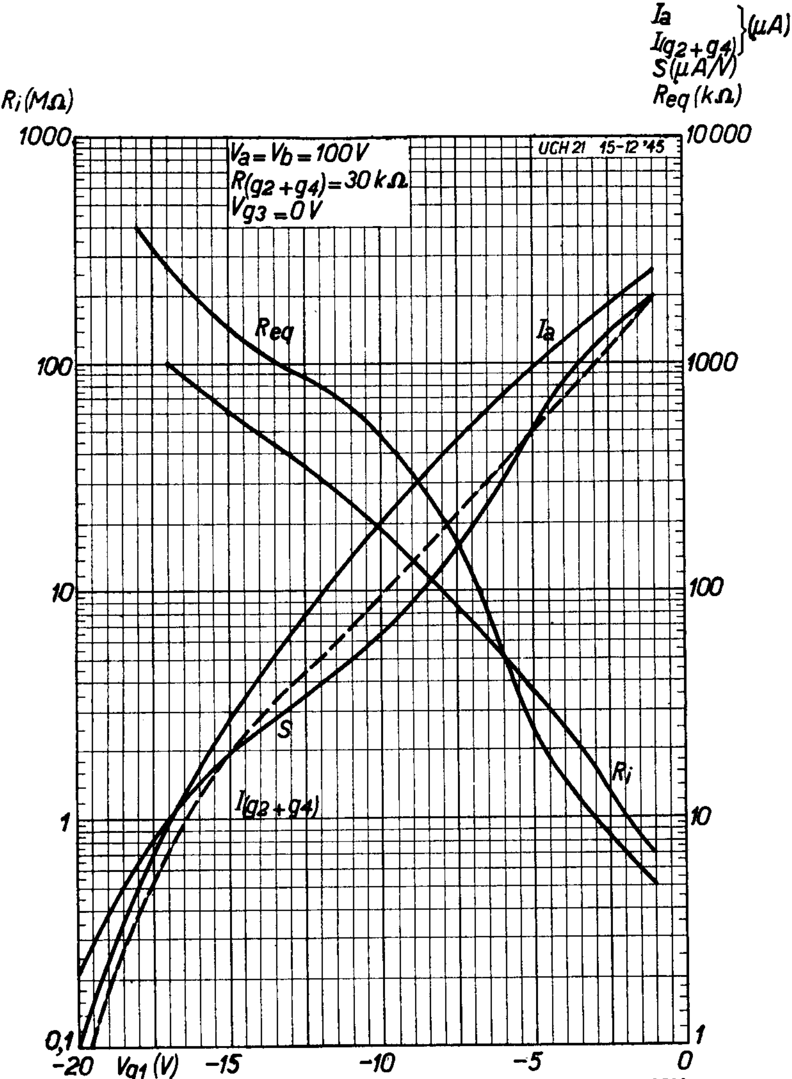
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"Miniwatt"



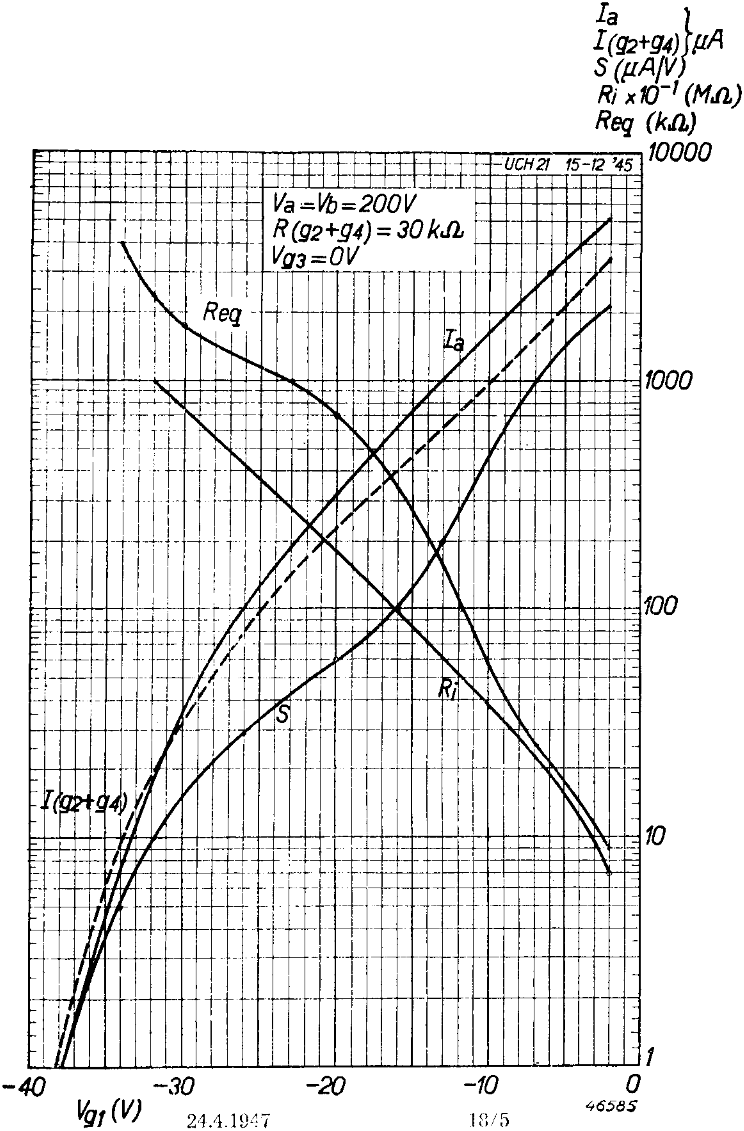

UCH 21 15-12-'45
46 587
V(g2 + g4) = 100V
Vg3 = 0V
Wa = 1,5W
Vg1 = 0V
-0,5V
-1,0V
-1,5V
-2,0V
-2,5V
-3,0V
-3,5V
-4,0V
-5,0V
-6,0V
-8,0V
-10V
Va (V)
Ia (mA)
0
100
200
300
400
500
5
10
15


Ia
I(g2+g4)
(μA)
S (μA/V)
Req (kΩ)
Ri (MΩ)
Va = 100V
V(g2+g4) = 100V
Vg3 = 0V
UCH21 15-12-'45
1000
100
10
1
0,1
10000
1000
100
10
1
Req
Ri
Ia
S
I(g2+g4)
-20
Vg1 (V)
-15
-10
-5
0
46582


I_a
$I_{(g2+g4)}$ } (μA)
S ($\mu A/V$)
R_{eq} ($k\Omega$)
R_i ($M\Omega$)
$V_a = V_b = 100\,V$
$R_{(g2+g4)} = 30\,k\Omega$
$V_{g3} = 0\,V$
UCH 21 15-12-'45
1000
100
10
1
0,1
10000
1000
100
10
1
Req
Ia
S
Ri
I(g2 + g4)
-20
Vg1 (V)
-15
-10
-5
0
46583

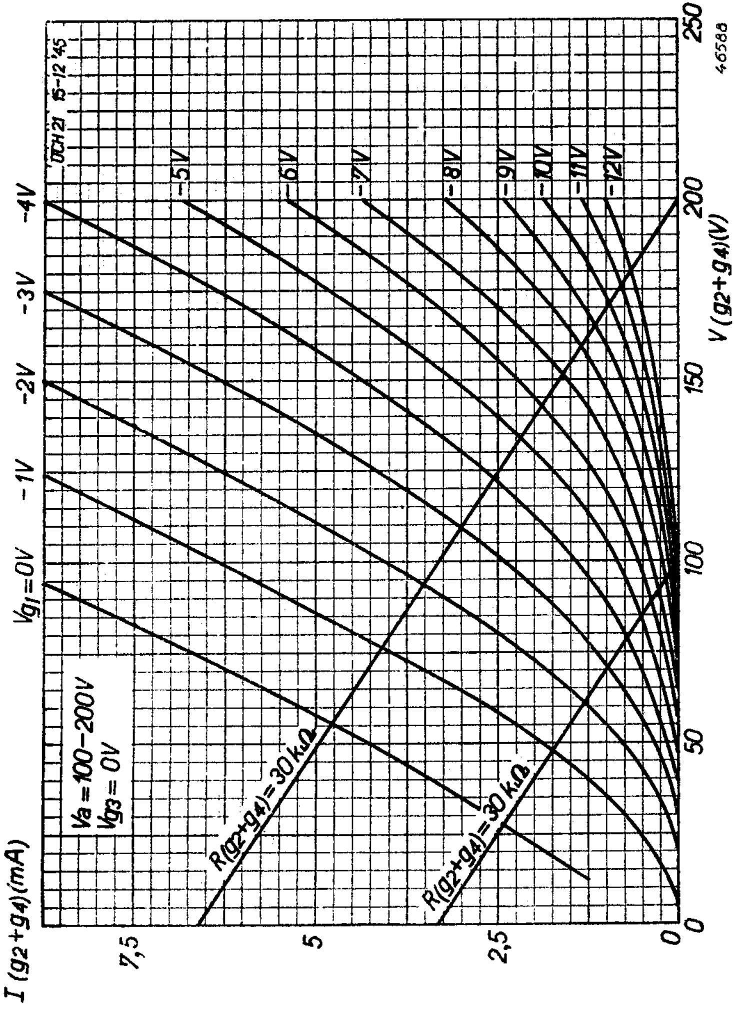
UCH21

"Miniwatt"

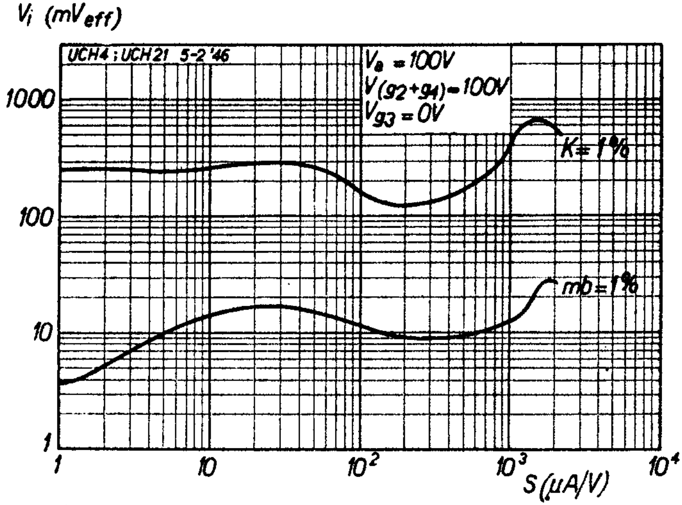


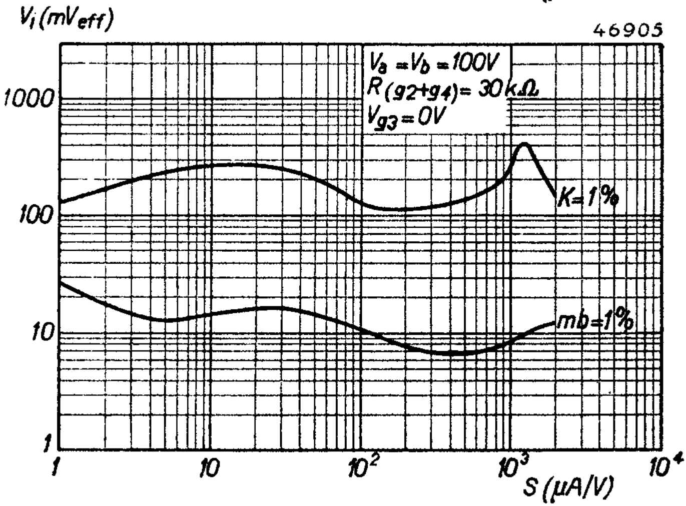
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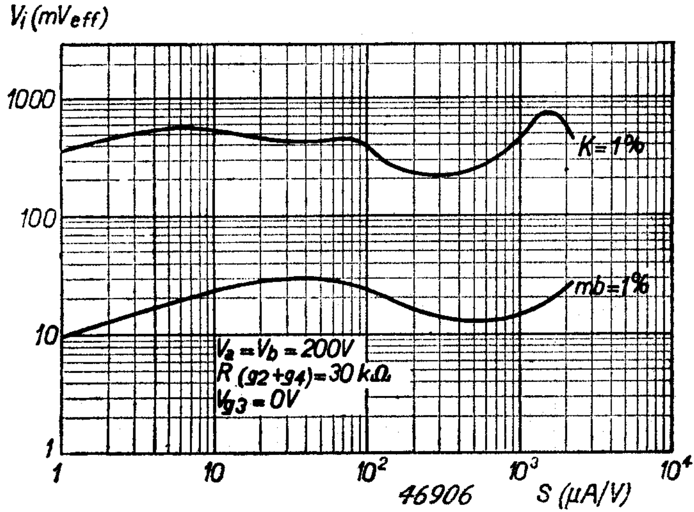
UCH 21



UCH 21 "Miniwatt"

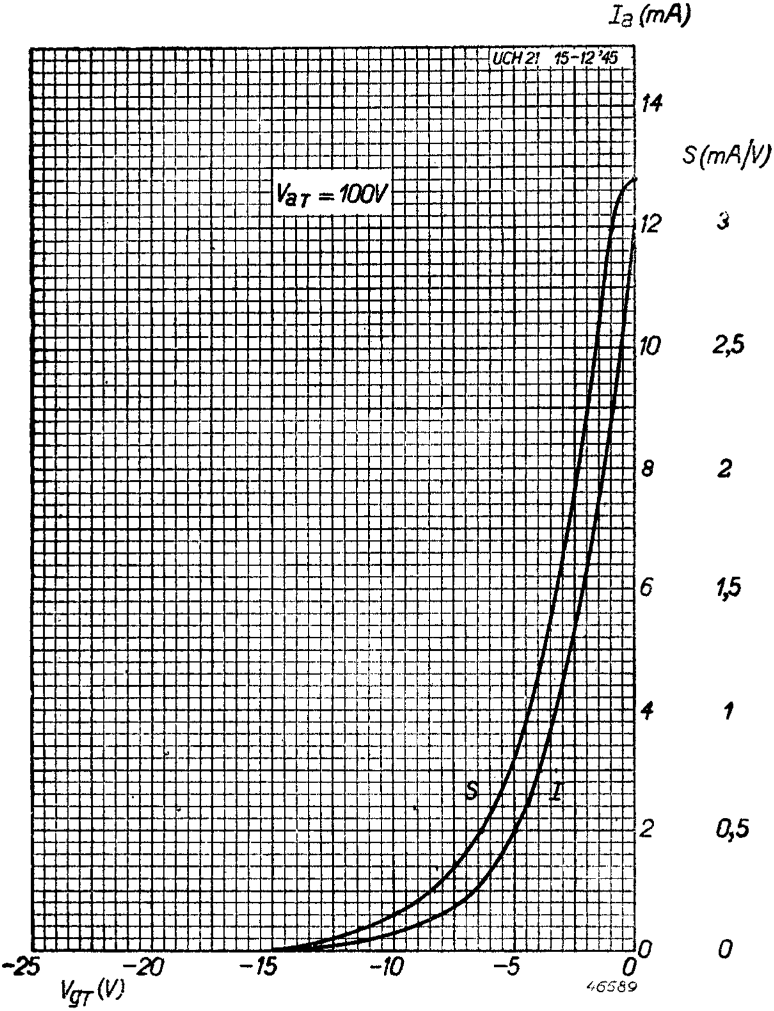






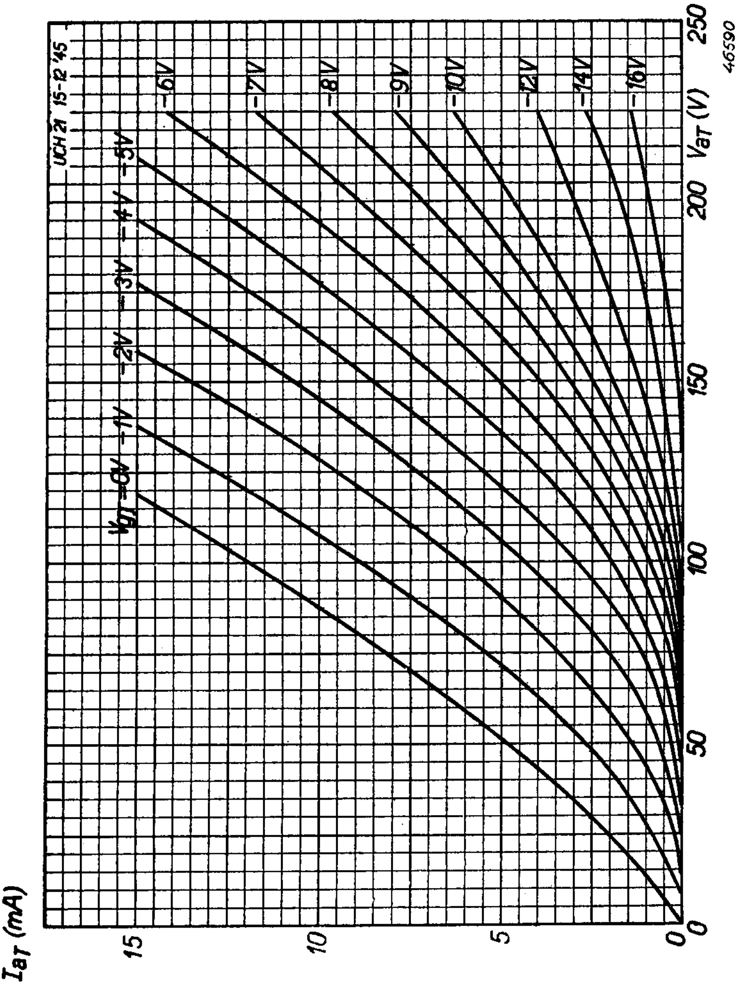
V_i (mVeff)
1000
100
10
1
1
10
10^2
10^3
10^4
K=1%
mb=1%
$V_a = V_b = 200V$
$R_{(g2+g4)} = 30\,k\Omega$
$V_{g3} = 0V$
46906
S (µA/V)

UCH 21 "Miniwatt"

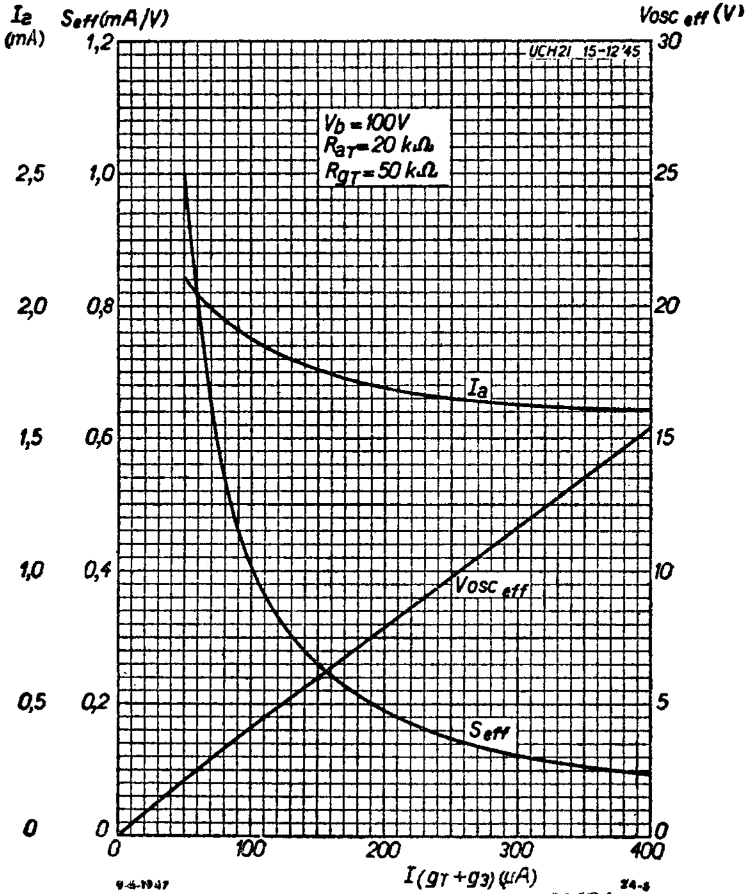


"Miniwatt"

UCH 21



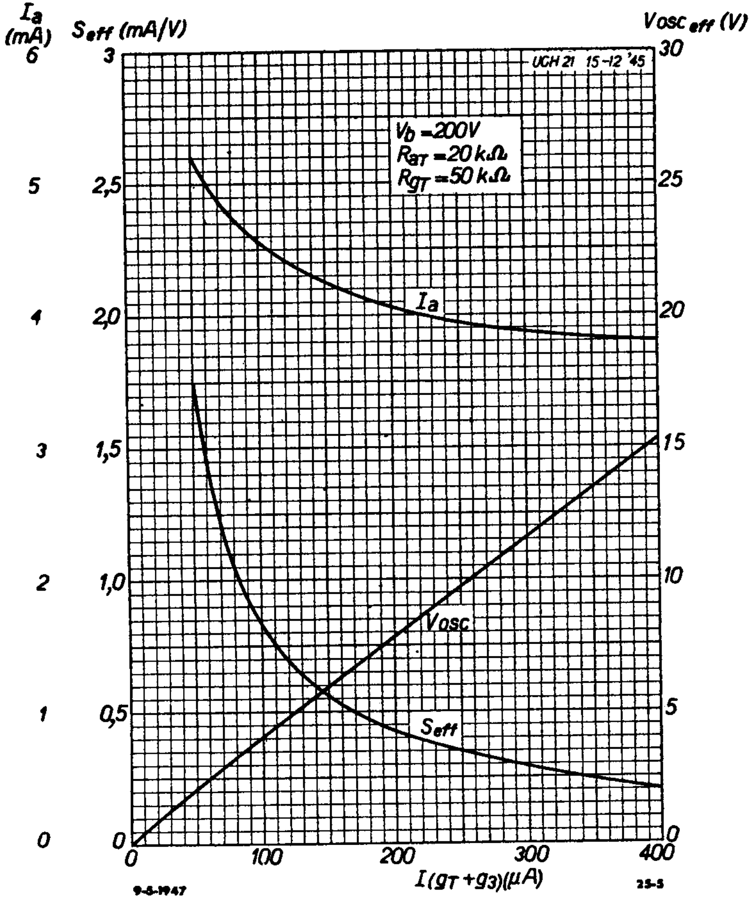
UCH 21 "Miniwatt"



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"Miniwatt" **UCH 21**



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